Gordonia.

By I. H. Burkill.

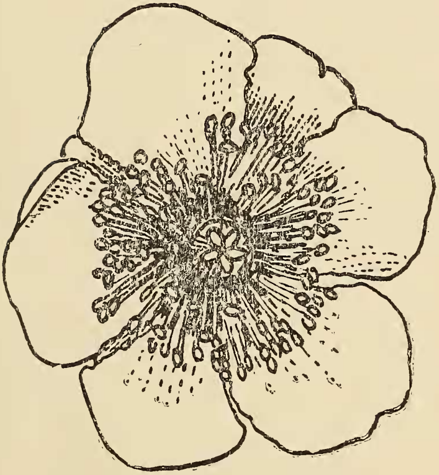

Fig. 1. The flower of *Gordonia singaporiana*, Wall., viewed horizontally. and enlarged by one third.

An enquiry upon a *Gordonia* undertaken for the Forest Department, led into such confused literature, that I have thought it well to draw together the following notes upon the genus in the hope that by publishing them, I may leave it a little more open to investigation. However but for Mr. Ridley's correction of some of the nomenclature in the Journal for 1916, I could not have done even this.

The genus is one of the Ternstroemiaceae, and the relationship to *Camellia* and *Thea* is fairly well suggested by the figure above.

Jour. Straits Branch R. A. Soc., No. 76, 1917.

THE FOUNDING OF GORDONIA ON AN AMERICAN PLANT.

The first *Gordonia* to become known was the American Loblolly Bay. In the eighteenth century it was a by-no-means rare shrub in the gardens of the curious in Natural History in Western Europe, as, from its home on the Atlantic seaboard from Maryland southwards to the mouths of the Mississippi, its seeds had been easy to procure, and the plant which attains the size of a tree in its own home, was found to flower in hot houses as a shrub. Linnaeus, as early as 1737, named it *Hypericum Lasianthus* when writing his catalogue of Clifford's garden, and repeated this name in his *Species plantarum.* Then John Ellis, a London merchant, who interested himself especially in what ships could bring him from the New World, upon the examination of a plant which flowered at Clapham, cut it apart from the genus *Hypericum,* and named it *Gordonia* (1770) after a well-known nurseryman, James Gordon then living in London.

From another plant cultivated at Vauxhall, on the outskirts of London, John Sims in 1802 figured flowers and foliage on plate 668 of the *Botanical Magazine.*

Linnaeus accepted the name *Gordonia* from the first and used it in his *Mantissa plantarum altera,* 1771, p. 570.

Into the genus *Gordonia* so established, another American plant was soon placed,—*G. pubescens,* (L'Héritier, *Stirpes novae,* 1784, p. 156), a tree found like *G. Lasianthus* on the Atlantic seaboard of the United States.

GORDONIA FOUND IN ASIA, BUT CALLED CAMELLIA.

On American soil, *Gordonia* has proved to be confined to these two species, the second of which is now reported extinct in a wild state. But above a score of species have been found in Asia.

At first there was some confusion among the European botanists in the East as to what should be called *Gordonia,* so that we meet with *G. oblata* and *G. integrifolia* in Roxburgh's works, and *G. Chilaunia* in Buchanan-Hamilton's, applied to what is now regarded as *Schima*: and there occurs a *G. spectabilis* in the manuscript of William Hunter, of 1803 (printed in *Journal* No. 54, 1909, p. 104) which is doubtless also a *Schima.* At the same period, but on the other hand, a true *Gordonia* of Chinese origin found its way into the genus *Camellia.* This last is the *G. axillaris* of Hongkong,—the first recorded plant of which was brought to the London nursery of Messrs. Whitley, Brames and Milne. In December, 1818, it flowered for the first time, and both the then-existing rival illustrated London botanical journals,—the *Botanical Magazine* and the *Botanical Register,*—obtained a drawing and both published under the date of February 1st, 1819. So similar are these two plates which we know came from the same plant, that they appear to have been drawn from the same branch, and not only from the same branch, but from the same branch with the same flower open. But in the letter press there are differences which must be referred to, the most important of which is that, under plate 349 of the *Botanical Register,* Ker, editing for Sydenham Edwards, wrote that the possessors of the plant had got it some years before from the late Dr. Roxburgh, the Superintendent of the Honourable East India Company's garden at Calcutta, and that Roxburgh had got it from Penang: whereas in the *Botanical Magazine* under plate 2047, Sims wrote that it was thought to be one of some Camellias received a few years previously from a Mr. Robarts from China.

While thus diverging both writers used the name *Camellia axillaris* referring to a manuscript left by Roxburgh, which the one called a Flora of India and the other merely a manuscript in the possession of Sir Joseph Banks. It is evident from the *Botanical Register* that Robert Brown, then librarian to Sir Joseph Banks, had been consulted; and it is therefore hardly possible to avoid the conclusion that Brown had identified the plant, but we do not know from what, as the published *Flora indica* of Roxburgh does not contain *Camellia axillaris.*

ROXBURGH'S CONNECTION WITH THIS PLANT IS VERY DOUBTFUL.

It is well known that before Roxburgh's death in 1815 he had furnished to various scientists copies of his Flora, keeping one in his own possession when he sailed from India, with the intention of revising it for publication, and that seventeen years after the father's death his two sons, Captains Bruce and James Roxburgh, caused the part dealing with the Higher Plants to be printed at Serampore in India, it is said "exactly as he had left it." Are we to assume that Banks had in 1819 a copy with late notes which escaped publication in 1832? It appears so: for, though Sir William Thiselton-Dyer records (Journal of the Linnean Society of London, XIII, 1873, p. 330) that he had searched in vain for the diagnosis of *Camellia axillaris,* (i) Brown would be unlikely to misquote, (ii) the two rivals would be unlikely both to misrepresent him, and (iii) the form of the brief diagnosis is just such as Roxburgh used. It was rendered from English into latin in both works with the term villous for describing the calyx in the *Botanical Register* but the term silky in its place in the *Botanical Magazine.*

So far then we may accept it that Roxburgh appears to have handled a plant from Penang which he called *Camellia axillaris;* but that does not prove it to be the Chinese plant which was described under this name in 1819; and, indeed, it is more likely that Ker invented the connection of the individual in Whitley, Brames and Milne's nursery with Roxburgh as a sequel to Brown's identification than that Sims is wrong in saying that a Mr. Robarts sent it from China. In any case the species does not grow in Penang, and though it could have reached Roxburgh via Penang from the

China coast the diagnosis as quoted is so very meagre, that it might easily apply to another plant of the same order such as occurs in Penang.

There is among the dried plants distributed by Wallich in 1832, a specimen labelled *Camellia axillaris* which is not the *Camellia axillaris* of (? Brown ex) Sims and Ker; and as the diagnosis does not fit it, it is probably some substitute. But it is said that the handwriting is Roxburgh's, and therein must be indubitable proof that Roxburgh used the name for some unrecognised species.

THIS ASIATIC GORDONIA PERSISTS IN CULTIVATION.

Probably from 1819 forward this Chinese plant so introduced by Whitley, Brames and Milne, was not lost to European gardens: it finds mention in several publications of the immediately following years, the chief of which was Robert Sweet's *Hortus Britannicus,* 1826, wherein the genus *Polyspora* was put forward for it and it became *Polyspora axillaris.* In 1842 it was at Kew, having been received from Liège, and flowered, furnishing plate 4019 of the *Botanical Magazine,* under which Sir William Hooker confidently stated it to be Chinese because he had got dried specimens from China. Quite recently (*Gardener's Chronicle,* lxi, p. 250, June 23rd, 1917) it has been figured again from Kew.

There are certain differences between Hooker's plate and the two which went before it, which may be touched upon next.

IT APPEARS TO EXHIBIT GYNODIOECISM BUT THIS WAS NOT SUSPECTED.

It had not escaped the wonderful acumen of Robert Brown that there was something sexually imperfect in the flower of the plant which he saw in 1818: it appeared female; but the flowers of the plant which flowered in Kew in 1842 were apparently fully hermaphrodite. This evidence of the occurrence of gyno-dioecism in the species is now supported by the discovery of similar sexual variations in allied plants. But apparently Choisy who monographed the order in 1855 did not appreciate it, so that (*Mémoires de la Société physique de Genève,* xiv, p. 141) he thought it necessary to make two species,—*G. axillaris* and *G. Lessertii,* of the two, and in doing this he appears also to have made some further confusion.

GORDONIA RECOGNISED AS AN ASIATIC GENUS; THE SEQUENCE IN WHICH SPECIES WERE DETECTED.

Returning to the year 1826 when Sweet tried to establish the genus *Polyspora* for *Camellia axillaris,* not putting it into *Gordonia* perhaps because there were in *Gordonia* the misplaced plants named on p. 134, we come to the announcement by the Dutch botanist Blume of the occurrence of *Gordonia excelsa* in Java, being the first placing of a true Asiatic *Gordonia* correctly. But it was not long before Wallich also recognised the genus; and species were added to species in the following order:—

1826. *G. excelsa,* Blume, a plant which occurs sparsely in the mountain forests of both east and west Java, between 1,500 and 7,000 feet.

1832. *G. obtusa,* Wallich[1], South-western India from the Konkan southwards in mountains between 2,000 and 7,000 feet, plentiful in the Nilgiri Hills.

1832. *G. singaporiana,* Wallich[1], in Singapore at low levels and also in Malacca; in Penang about the hill tops. It is the *G. grandis,* of King, but not of André.

1840. *G. zeylanica,* Wight, Ceylon in the forests from 4,000 to 7,000 feet.

1846. *G. elliptica,* Gardner, Ceylon in the forests of the Central Province, but doubtfully distinct from the last.

1855. *G. speciosa,* Choisy, Ceylon, very local in the higher mountains.

1860. *G. brevifolia,* Hooker fil., Borneo on the Mountain of Kinabalu at 8,000 feet.

1860. *G. Lobbii,* Hooker fil., Borneo in Sarawak.

1874. *G. Maingayi,* Dyer, Perak and Malacca, on the lower slopes of mountains.

1876. *G. dipterosperma,* Kurz, Sikkim Himalaya and Khasia hills. It has been reduced to *G. excelsa,* Blume, in several works.

1880. *G. grandis,* André, a garden plant, imperfectly known.

1886. *G. luzonica,* Vidal, Luzon, common in the higher mountains. It was redescribed in 1906 as *G. fragrans,* Merrill.[2]

1890. *G. Scortechinii,* King, Perak.

1890. *G. imbricata,* King, Perak and Pahang, in the mountains.

1890. *G. multinervis,* King, Perak and Singapore.

1906. *G. sinensis,* Hemsley and E. H. Wilson, S.-W. China on Mount Omi.

1908. *G. Welborni,* Elmer, Southern Philippine islands in mountains.

1910. *G. Balansae,* Pitard, Tonkin on the Mountain of Ravi near Sougi.

1910. *G. tonkinensis,* Pitard, Tonkin, in the neighbourhood of Ninh-binh.

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[1] Wallich's lithographed catalogue of the plants in the East India Company's herbarium has been ruled to be no publication: but these names, are valid nevertheless, though not from 1832.

[2] Mr. Merrill himself reduces this.

G. acuminata, Vidal (*G. Vidalii,* Szyszylowicz) described from Luzon in 1886 is shown by Mr. E. D. Merrill not to be a Gordonia at all.

1916. *G. penangensis,* Ridley, Penang and Singapore. It was misnamed *G. excelsa* by King in 1890.

1916. *G. hirtella,* Ridley, mountains of the Malay Peninsula from Perak to Negri Sembilan.

To these 24 species I have four to add, being *G. taipingensis* from the hills near Taiping, *G. concentricicatrix* from Selangor, *G. Havilandii* from Sarawak and *G. lanceifolia* also from Sarawak, making 28 in all: but as I consider the Asiatic species of *Haemocharis* to be Gordonias, the genus is really in my view of well over 30 species: but all of them want more study.

ATTEMPT TO DIVIDE GORDONIA IN CONFORMITY WITH ITS DISCONTINUOUS DISTRIBUTION.

Szyszylowicz (in Engler's *Pflanzenfamilien,* iii. part 6, 1893 p. 185) divided the genus Gordonia into two sections, the American species forming the first, and the Asiatic species the second. He gave no sectional names, and did not define the two. Korthals and Pitard have separately gone further in attempts to cut the Asiatic species from the American. Korthals' attempt was made long ago (*Verhandel. over de Natuurlijke Geschiedenis der Nederland overzeeische Bezittingen, Kruidkundig,* 1839-1842). He made two new genera to hold the Malayan species regardless of the existence of *Polyspora;* and on p. 127 he wrote "The plants on which the genera *Antheeischima* and *Closaschima* (his new genera) have been established, were formerly written up and described under the genus *Gordonia;* but a closer comparison with material of the American types, leads me to observe that this union of Indian and American plants can be severed, and leads me on into presenting two new genera for the former, cut out of *Gordonia.*" This shows him dominated by the idea that plants from opposite hemispheres should not be in the same genus. And he continues defining the first genus *Antheeischima* upon doubtful interpretations of its bracts and calyx adding the last sepal (which is seen in fig. 1. to the top and right) to the petals and another sepal to the bracts so as to reduce the number to 3; and on "the stamens being free in *Gordonia* or united into five bundles; but in *Antheeischima* grown together with the petals into a ring." He next admits this genus as rather indistinctly defined but "*Closaschima* differs by reason of its more shrubby growth, lesser development of leaves, and flowers and in some floral characters; it has five or apparently by the enlargement of a bract six sepals, five petals spirally arranged and five stigmas almost without styles."

The last character is that of *Haemocharis* into which his genus has been placed in later years, while the single species making the genus *Antheeischima* has been returned to *Gordonia* as Blume's *G. excelsa.* Yet Korthals continues under *Closaschima* to describe the *C. marginata* as having a style.

Pitard has taken a roughly parallel line. In the *Actes de la Société Linnéenne de Bordeaux,* 1902, Comptes rendus, p. 54, he tries to establish the genus *Nabiasodendron* for the Asiatic Gordonias, at the same time separating the two American species from each other generically. Like Korthals he points to the arrangement of the stamens; but then Korthals did not know the *Gordonia speciosa* of Ceylon which has its stamens in five distinct bundles like *G. Lasianthus,* and Pitard does; so Pitard does not find the character absolute and turns to the capsule for a supplementary one, and after it to anatomical characters.

DISCONTINUOUS DISTRIBUTION IS BY NO MEANS UNUSUAL IN GENERA ALLIED TO GORDONIA. THEIR DEMAND FOR MOISTURE RULES THEIR DISPERSION.

Like Korthals, Pitard seems to have been dominated by an idea that the discontinuous distribution requires that we should find generic characters between those plants which occur in eastern America, and those which occur in eastern Asia. It is a wrong presumption because there are several allied genera equally astride the Pacific, among those comprising the Theeae and Ternstroemieae as the reader will observe if all the genera be enumerated:—

Bonnettia, coasts of tropical S. America.
Archytaea, coasts of the Pacific from S. America to Penang.
Asteropeia, Madagascar.
Thea (including *Camellia*), from Assam to Japan and to Java.
Gordonia (i) eastern coasts of N. America.
    (ii) forests of the Himalaya and S. China to Java chiefly on mountains.
Haemocharis (i) W. Indies and tropical S. America.
    (ii) Borneo, Java, Sumatra and Moluccas.
Schima, as Gordonia (ii).
Hartia, S.-W. China.
Pyrenaria, as Gordonia (ii).
Stewartia (*Stuartia*), (i) Mountains of eastern N. America.
    (ii) Japan.
Ternstroemia, (i) S. America.
    (ii) as Gordonia (ii).
Patascoya, north-west S. America at 10,000 feet.
Anneslea, Himalaya to the Philippine Islands.
Adinandra, (i) as Gordonia (ii).
    (ii) Island of St. Thomé on the West coast of Africa.*
Ternstroemiopsis, Sandwich islands.
Eurya, (i) Mexico and the W. Indies to Venezuela.
    (ii) India to the Pacific.

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* This isolated species needs re-examination.

Freziera, S. America.
Vismea, Canary islands.
Tremanthera, New Guinea.

And from such a review of the genera, allied to *Gordonia,* we turn with at least the suggestion that discontinuous distribution is not so rare in the order as to afford any strong reason for Korthals' and Pitard's endeavour to cut the Asiatic Gordonias from the American.

In fact what we have in the Theeae and Ternstroemieae is such a noteworthy demand for damp air as to restrict them either to damp seaboards or to mountain forests or to rain forests that are not too hot. With a centre about the Pacific, local climates have ruled where they should persist, and the discontinuous distribution is because all but a small part of North America is too dry.

INSTEAD OF SPLITTING GORDONIA, IT APPARENTLY SHOULD BE ENLARGED BY THE INCLUSION OF AT LEAST THE ASIATIC SPECIES OF HAEMOCHARIS.

Not only do I fail to follow the bias, but I find characters contrary to Pitard's statement that *Nabiasodendron* has blunt capsules and *Gordonia* pointed, and instead of cutting down *Gordonia,* I believe that *Haemocharis,* at least in the East is not distinguishable from it; and I recommend that the two be examined with a view to union. The only difference is in the presence of a style in *Gordonia* and its absence in *Haemocharis,* a difference which puts *Gordonia singaporiana* for instance on either side of the line according to the view of the moment, and prompted the remark of Koorders and Valeton in regard to *Haemocharis integerrima* (*Mededeelingen 'S Lands Plantentuin,* No. 16, 1896, p. 294) "stylis fere dimidio leviter connatis apice obtuse divergentibus, haec species demarcationes inter genera Gordonia et Laplacea (Haemocharis) fere plane aufert," *i.e.* it comes within a trifle of breaking down the boundary.

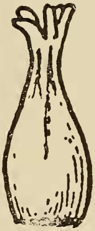

Fig 2. Ovary of *G. singaporiana* at the time of the fall of the corolla showing how undefined in the style.

There is one point to be set out before proceeding, namely that the Asiatic species of *Haemocharis* owe their position in that genus in a very large part to Miquel. They are rare plants in herbaria, which seem to have been seldom consulted of recent years. There is consequently no concensus of modern opinion placing them where they are: and though Otto Kuntze changed the names of some, he was not working as a botanist but as a lexicographer. If the Asiatic species of *Haemocharis* be transferred to *Gordonia,* the genus is enlarged by the following:—

H. vulcanica, O. Kuntze, (sphalm. *vulcania*) being Korthals' *Laplacea vulcanica,* described in 1840 or 1841 from Mt. Meropi in Sumatra.

H. marginata, O. Kuntze, first described in the same place as *Closaschima marginata,* from Mt. Tirin and from near Martapura in Borneo.

H. ovalis, O. Kuntze, first described along with the last two as *Closaschima ovalis* from the forests of Melintang in Sumatra.

H. buxifolia, Szyszylowicz, first described by Miquel as *Laplacea buxifolia* in 1862 in his *Sumatra, zijne Plantenwereld* p. 482, from Paya Kombo in Western Sumatra.

H. aromatica, Szyszylowicz, first described by Miquel along with the last from Mangala in the Lampongs province, and also from Priaman, in Sumatra.

H. subintegerrima first described by Miquel along with the last two, from Kobu-lahat in the Province of Palembang, Sumatra.

H. integerrima, Koorders and Valeton, first described by Miquel in the *Annales Musei botanici Lugduno-Batavi,* iv. 1869, from Preanger in West Java.

H. amboinensis first described as *Laplacea amboinensis* by Miquel in the same place as the last.

H. serrata, Koorders and Valeton, described in *Mededeelingen van 'SLands Plantentuin,* No. 16, 1896, p. 296.

Of the genus Miquel remarks that it descends to low levels (*Sumatra, zijne Plantenwereld,* p. 483), but not in Java. So too does *Gordonia* descend to low levels in the Malay Peninsula, but not in India and Ceylon.

SIZE ATTAINED BY GORDONIAS.

The home of the American species of *Gordonia* is swampy hollows among the pines of the Pine barrens along the sea coast. The home of all the eastern species as far as recorded is sloping ground in dense rain forests and often on the crests of the ridges in these forests. On such crests the trees are apt to be dwarfed by conditions, and it is almost certain that foresters will soon show that the botanists who have described the plants have by far understated the sizes attained by many of the species. These are the sizes so far recorded:—

G. Welborni attains 50 meters or 160 feet.

G. singaporiana 43 meters or 120 feet.
G. excelsa 25 meters or 80 feet.
G. Lasianthus 24 meters or 75 feet.
G. obtusa 20 meters or 60 feet, or perhaps more.
G. multinervis
G. Lobbii } 15 meters or 50 feet.
G. speciosa
G. penangensis
G. Maingayi } 12 meters or 40 feet.
G. sinensis
G. luzonica (*G. fragrans*)
G. Balansae } 8 meters or to 25 feet.
G. pubescens
G. brevifolia 4 meters or 14 feet.

Ridley in the *Journal of the Federated Malay States Museums,* iv, 1909, p. 6, speaks of very large Gordonias occurring on the upper ridges of the Telom district of Pahang. The species was not determined.

But unfortunately so many of these species are known from observation in but one or two localities, and again we know that flowering is no criterion of age, as in European gardens *G. Lasianthus* will flower at 8—10 feet, *G. pubescens* at 4—6 feet, and *G. axillaris* at 3 feet (see Nicholson's *Gardener's Dictionary* article Gordonia): and we know also that the first named may be reduced by conditions in its own home to a bush (see Sargent, *Manual of the trees of N. America,* 1905, p. 678). *G. singaporiana* also flowers as a bush. Almost all from the economic point of view are inadequately known.

There are no records of the rate of the growth of the eastern Gordonias. Tree No. 1505 V. in the Botanic Gardens, Singapore,—*Gordonia singaporiana,*—is now 145 cm. in circumference at 130 cm. from the ground; and this dimension is here recorded that some observer in the future may measure it again. Its height may be, about 70 feet, and it branches high; but tree 1508 H, which is in the open, branches low down.

THE TIMBER.

The timber of *Gordonia Lasianthus* is stated by Sargent to be light, soft, close-grained, not durable, light red........occasionally used in cabinet making.

The wood of the eastern species finds a perhaps greater appreciation. Beddome (*Flora Sylvatica,* 1874, under t. 83) wrote of *G. obtusa* that the wood is "white with a straw tint, even grained and pleasant to work, not unlike beech; very generally used for planks, doors, rafters and beams, but warps if not well seasoned." In the *Indian Forester* ii, 1876, p. 23, while stating that the timbers in the sholas or woods of the Nilgiri plateau are of less value than those of the slopes, he named *Gordonia obtusa* with seven others, as being chiefly in use. Gamble, *Flora of Madras,* i, 1915, p. 80, says, wood reddish, hard, and close grained, but little used. Trimen recorded of the Ceylon *G. zeylanica* (*Handbook of the Flora of Ceylon,* i. 1893, p. 111) "wood red, smooth, hard, shining" and after this he adds words which imply that the carpenters up country in Ceylon are familiar with the use of it. Ridley quoting Maingay, (*Agricultural Bulletin of the Straits and Federated Malay States,* i. 1901, p. 48) wrote of the Malayan *G. excelsa,* (but Maingay though doubtless referring to a *Gordonia* may not have had *G. excelsa* before him), "Wood pale red, fine to medium grain, good for houses, beams and boats. Weight 59 lbs. 5¾ oz. and 65 lbs. 7½oz." De Sturler, (*Cat. Descript des espèces de Bois de l'Archipel des Indes Orientales,* 1867. p. 16) stated that a *Gordonia* of W. Java* furnishes a reddish brown wood of great density employed by carpenters; and that it works well. On p. 36 under the name of Aylapia, he stated that a *Gordonia* of Amboyna gave a reddish wood, used but not durable.

Cantley's collector in Malacca in 1886 obtained *G. singaporiana* with the note that the timber is used in house building and is durable. The same in 1885 noted of what appears to be *G. hirtella* that the wood is a dirty dark colour, and its heart black, that it sinks in water and is used for house posts being very durable for this purpose.

Elmer while giving no uses for *G. Welborni* describes the wood as "hard, somewhat burly,........and reddish."

Moll and Janssonius (*Mikrographie des Holtzes der auf Java vorkommender Baumarten,* 1906, p. 334) described the structure of the wood of *G. excelsa,* from Koorders' material; and on p. 338 they described the wood of *Haemocharis integerrima.*

Whitford (*Forests of the Philippines,* part ii, 1911, p. 59) states that *Gordonia luzonica* is of no importance to the lumberman.

THE FOLIAGE.

All the Gordonias are evergreen. Foliation in *G. singaporiana* occurs in flushes of about four leaves generally of increasing size, and the next leaf is small again, but the last leaf may be small especially if it subtends a flower; and leaves at various points may also be small subtending flowers. The leaves persist over more than a year, and there may perhaps be two flushes in the twelve months. At the top of the forest their length may be 15 cm., but young trees in shade carry leaves as much as 35 cm. long, by 10 cm. in breadth.

Along the margins of the leaves of Gordonia, when expanded, little blackish bodies may be seen, which if the leaf has teeth are on their apices, but are not absent if the teeth be so. These are mucilage glands, whose function is to keep the young tissues from injury while still packed in the bud. When the leaves expand, they are already dead in the Asiatic species but I have seen them to be still alive on young expanded leaves of the American *G. pubescens,* and perhaps their structure differs. It is interesting to link this protective function with the demand that the tree makes for moist air. A little nerve runs out to the glands. This same type of gland occurs in allied genera such as *Adinandra,* as in *Gordonia imbricata* and *G. Scortechinii,* where the leaves are toothless. The apex to the leaf also is glandular, and dies as or before the leaf unfolds, often leaving an emargination. Some of the earlier botanists have tried to make a character of this emargination, but the degree to which it has gone in any particular leaf may be but a response to local or to temporary air conditions. Reference may be made to fig. 15, on p. 158, where two flushes are represented. At the commencement of the first, weather conditions appear to have been such as to destroy with the apical gland quite a distinct piece of the neighbouring tissues: these conditions were not repeated. Hairs are present on the young parts which vanish like the glands more or less completely with age: in the leaf bud they are protective similarly. They afford no good specific characters.

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* This is more likely to be *Haemocharis integerrima* than *Gordonia excelsa.* Both have the same vernacular name—Kimandjel.

THE FLOWERS.

Flowers are formed on very short axillary shoots in the upper leaf axils of a flush or in the axils of cataphyllary leaves following. If the terminal bud should die they appear as if terminal on the foliar branches, and this seems particularly to happen in *G. penangensis.* In this species the weight of a falsely terminal capsule on the rather slender branchlets makes it to hang; but in most species they dehisce upwards, see fig. 7 of *G. hirtella.*

The Gordonias, as said, may be got to flower at relatively small sizes. No information is available as to subsequent seed-formation; but in Singapore *G. singaporiana* already seeds at a height of 6 meters.

No information is available as to the formation of flowers in *Gordonia* sexually imperfect, except that a female condition was found in the first observed plant of *G. axillaris.* However as Urban (*Berichte d. deutsch. bot. Gesellschaft,* xiv, 1896, p. 51) has found male and female flowers in the Tropical American species of *Haemocharis,* the occurrence of sexually imperfect flowers in a *Gordonia* is hardly isolated. Further Urban ascribes to the male flower a short style, which makes the definition between *Gordonia* and *Haemocharis* just nothing.

The old trees of *G. singaporiana* in the Botanic Gardens, Singapore, have their flowers fully hermaphrodite. They open in the evening or after dark, facing horizontally or slightly downwards, and fall during the next forenoon. They have a smell which is fairly strong, but hardly fragrant; they are in colour creamy white: they are produced over many months of the year. Infertile flowers perish in the horizontal position of flowering: fertile capsules however resume a more or less upright position and the mature capsule dehisces on the tree facing more or less upwards. It is hygroscopic, closing slowly if wetted and opening slowly again when dried. The walls of the loculi fit over the seeds very closely so that these escape with difficulty, and it is quite common for the capsule to fall to the bottom of the forest with them still enclosed.

THE SEED AND SEEDLING.

The germination of *G. singaporiana* has been watched. In it the seed coats are split along the longer free margin of the seed and the radicle is extruded. When this has anchored the cotyledons are raised up and with them the seed coats, from which they escape in consequence of their efforts to attain a more or less horizontal position.

The cotyledons are somewhat arched, and are without the mucilage-glands of the later foliage. With our present scant knowledge of the species of *Gordonia* the characters of the foliage help us more than anything else to a scheme of classification, probably in no way because they are the best, but because we know too little about the capsules. As regards the latter not only do we suffer from the circumstance that from many of the species they have not been collected yet, but also from the fact that the differences in them are difficult to bring out in descriptions unaccompanied by drawings. Towards a remedy the following line blocks may do a little. The next proceeding towards understanding the genus, apart from the collecting of more material, is a re-examination of the Sumatran and Bornean types in Dutch herbaria.

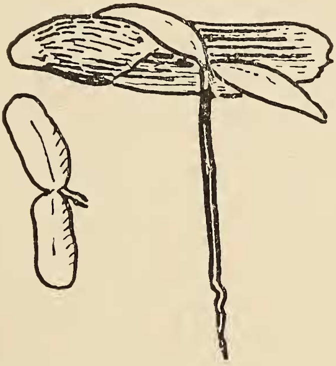

Fig. 3. Seedling of *G. singaporiana* with the cotyledons freeing themselves from the seed coats. To the left are the cotyledons seen from above.

THE KNOWN SPECIES OF GORDONIA AND THE ASIATIC SPECIES OF HAEMOCHARIS.

The most outstanding species of the whole genus is the North American *G. pubescens.* The following enumeration will be started with it.

Gordonia pubescens, *L'Héritier,* Stirpes novae, 1784, p. 156. *G. Altamaha,* Sargent, Manual Trees, N. America, 1905, p. 679.

This species used to be found on the Altamaha river in Georgia but has long been extinct in a wild state. Its leaves have a conspicuous venation. Its flowers are 8 cm. in diameter on short peduncles. Its stamens are inserted separately, and their length relative to the size of the flower is small. The ovary is "truncate and crowned with a slender deciduous style nearly as long as the stamens." The capsule is globose and septicidal from the base. Its seeds are very characteristic, sharply defining it from all other Gordonias: for they are wingless.

There is a line figure of it in Sargent's book.

G. Lasianthus, *Linnaeus,* Mantissa 1771, ii. 570: Sargent, Manual Trees, N. America, 1905, p. 678: in foliar characters lies close to the above: the venation is distinct. The flowers are on long peduncles slender below, but thickening to the flower: they are 6-8 cm. in diameter, white, and with the relatively short stamens united into five bundles at their insertion. The ovary is "gradually contracted into the stout style." The capsule is ovoid and the seeds are winged. Its distribution is from Maryland all along the pine barrens of the Atlantic coast into the Gulf of Texas to the mouths of the Mississippi.

Sargent gives a line figure of it.

Gordonia sinensis, *Hemsley and E. H. Wilson,* in Kew Bull. 1906, p. 153, is described by the authors as of Asiatic Gordonias the most nearly allied to the American species. It has leaves with veins prominent on both surfaces. The white flowers are described as about 5 to 6.5 cm. in diameter. But its capsule is unknown. The petiole is up to 1.5 cm. long. The stigma is said to be "capitate."

Mr. E. H. Wilson got it in the forests of Mt. Omi, Szechuen, Western China.

G. penangensis, *Ridley,* in Journ. Straits Branch, Roy. Asiatic Soc., No. 73, 1916, p. 142: *G. excelsa,* King, in Journ. Asiatic Soc. Bengal, lix, 1890, p. 203, not of Blume.

This species is noteworthy for the slenderness of its branchlets which so bend under the weight of the capsules as to make them pendulous. Its leaves are rather small and the petioles for the genus longish. A little hair persists at maturity on the backs of the blades near to the midrib. Its flowers are 3 cm. in diameter and are described by Curtis as yellow and by Ridley as pinkish yellow. The ovary narrows into a long style. Curtis got it as a medium sized tree at 1,500 and 2,400 feet in Penang island. Ridley as a tall tree at about sea level at Seletar and at Chanchukang in Singapore island. It is to be noted that Pitard's character of blunt capsules for *Nabiasodendron* is not upheld by this species.

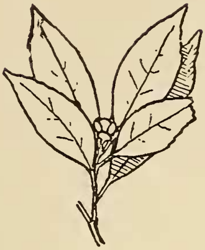

Fig. 4. Foliage and flower of *G. penangensis*, reduced to $\frac{1}{5}$, from Curtis 834.

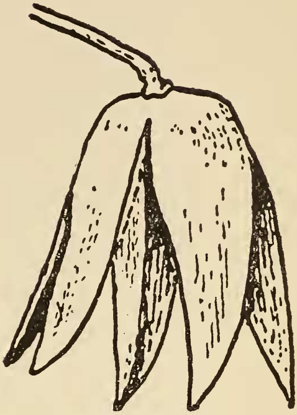

Fig. 5. Capsule of *G. penangensis* nat. size, from Curtis 834.

G. Maingayi, *King*, in Journ. Asiatic Soc. Bengal, lix, 1890, p. 204, is extremely near to *G. penangensis*: and the ovary narrows in the same way into the style.

It was obtained first by Maingay who collected in Malacca, and then by Scortechini and Wray who collected largely in the hills near Taiping but did not record their localities. I have not seen Maingay's plant.

G. taipingensis, one of the new species here described, has large leaves and large flowers. In outline the leaves agree with those of *G. penangensis*.

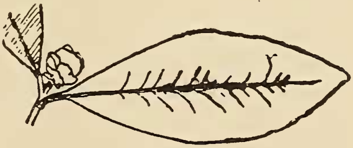

Fig. 6. Leaf and bud of *G. taipingensis*, reduced to $\frac{1}{5}$, from the type specimen

Gordonia taipingensis, *Arbor,* 40- vel 50-pedalis, cortice avellaneo-umbrina. Ramuli ultimi 3 mm. crassi, fusco-avellanei *Folia* elliptica ad elliptico-obovata, basi attenuata, apice acuminata, pergamentacea, margine in superiori parte solum inconspicue crenulata, venis lateralibus supra atque infra visibilibus, glaberrima, ad 29 cm. longa, ad 7 cm. lata: petiolus crassus, ad 2 cm. longus. *Flores* majusculi diametro 6 cm., lutescentes. *Sepala* dense sericea, maxima 15 mm. longa. *Petala* dense sericea, ad 3 cm. longa. *Antherae* numerosissima , versatiles, fere 2 mm. longae: filamenta basi pubescentia, 7—9 mm. longa, omnia discreta in petalis conjunctis inserta. *Ovarium* dense sericeum apice in stylo augustatum, vix 1 cm. longum stylo 2 mm. et stigmatis 2 mm. longis inclusis. Capsula ignota.

PERAK. In monte Taiping hill dicto ad 3,500 ped. alt., cum floribus mense Februario collegerunt Mohamed Haniff et Mohamed Nur, sub numero 2359.

G. obtusa, *Wallich,* Cat. Lith. 1832, No. 1459, name only; Wight, Illustr. 1840. i. p. 99: Dyer in Hooker fil. Flora Brit. India, i. 1875. p. 291; Gamble, Indian Timbers, p. 67: Talbot, Forest Flora Bombay. i. 1909, p. 106: Gamble, Flora Madras Pres., i. 1915, p. 79. *G. obtusifolia,* Wight, loc. cit.

This is clearly near to *G .Maingayi,* as Sir William Thiselton-Dyer pointed out. The flowers are larger and the leaves harsher. The colour of the flowers is creamy white and their diameter about 7.5 cm. The ovary is represented as narrowing into the style, and the style as being tubular almost to the top of the ovary. Sometimes the stigma is 4-lobed. It is a common tree in the little patches of forests which occur in the ravines of the Nilgiri hills chiefly on the eastern side, between 5,000 and 7,000 feet. From the Nilgiri hills it extends southwards and reaches lower levels on the damp western face of the Travancore slopes: also it reaches the Bababuden hills in Mysore.

Wight gave the name *G. parvifolia* to a plant which he obtained in Courtallum with smaller leaves and their margins almost toothless, but later botanists who have had a right to an opinion, have considered it as not distinct from *G. obtusa.*

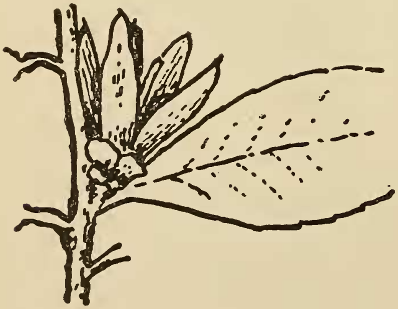

Fig. 7. Capsule of *G. hirtella,* slightly reduced, from Ridley 7350.

G. hirtella, *Ridley,* in Journ. Straits Branch, Roy. Asiatic Soc., No. 73, 1916, p. 142, has foliage like that of *G. taipingensis,* but is widely different in its smaller flowers (only 2 cm. in diameter) and smaller leaves (up to 14 cm. in length). The capsules of *G. taipingensis* being unknown, the comparison cannot proceed to them, but in *G. hirtella* as the drawing shows they are small and the lobes after dehiscence are finger-like. The ovary narrows gradually into the style.

G. hirtella occurs on the Central Chain of mountains of the Malay Peninsula from Gunông Batu Puteh in Perak to the west of Tapah, where Wray got it at his lower camp (Wray No. 116) through Bukit Kutu in Selangor at 3,000 feet, (Ridley 7350) to Bukit Etam at the same height (Kelsall 1848) on the Selangor-Negri Sembilan boundary. Further there is a specimen which appears to be it in the Singapore herbarium collected for Cantley (No. 1296) at "Kandong" by which name is probably indicated the Kendong in Negri Sembilan lying close to the foot of Gunong Tampin. Cantley's collector stated that the heartwood is black, and the albumen dark in colour, and that it makes very durable house posts.

The flowers are creamy white.

G. tonkinensis, *Pitard,* in Lecompte, Flore générale de l'Indo-Chine, i. 1910, p. 348, by the description appears to lie near this place in the sequence. Its elliptic leaves attain 13 cm. in length, and have small crenulations sometimes towards the apex. They have a petiole up to 1 cm. in length, and the venation is almost totally obscured by the coriaceousness of the leaf-blade. Pitard gives a figure of the small capsule, which in shape is not unlike the unexpanded capsule of *G. hirtella,* but from his description is yet smaller by one third.

The flowers are unknown. Abbé Bon collected it near Ninh binh in Tonkin, *i.e.,* not far from the coast.

G. luzonica, *Vidal,* Revis. Pl. Vasc. Filip., 1886, p. 57. *G. fragrans,* Merrill, in Philippine Journ. Science, i. Suppl. 1906, p. 95.

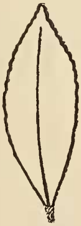

Fig. 8. leaf of *G. luzonica*, reduced to $\frac{1}{5}$ from Borden 809.

With this species we begin distinctly to approach those where the petiole is scarcely present; Merrill in describing it gives the length as 5 mm. or less. The blades of the leaves are oblong lanceolate, the broadest part being not yet carried above the mid length: the margins have obscure crenations in the upper part: the nerves are not so obscure as in many species, the degree being much as in *G. hirtella.* The white flowers are fairly large (5 cm. in diameter), and are fragrant. The ovary is oblong-ovoid. The capsule in shape is very like that of the *G. lanceifolia* figured below, and is described as 3 cm. long.

G. luzonica appears to be not uncommon on the mountains not remote from Manila bay.

I have before me a specimen from Baguio in the Province of Benguet, Luzon, (Curran 5083) which in its foliage and capsules appears to be distinct from *G. luzonica.* The leaves carry a large amount of hair, and are broader than those of *G. luzonica*: the capsules are 4 cm. long and so larger. The Baguio country is a country of ravines with at the best scrubby forest and without the true rain forests in which *G. luzonica* lives usually. It is true that *G. obtusa* occupies somewhat similar ravines in the Nilgiri hills as well as places in the rain forests towards the Arabian Sea, so that the different situation is no base for a case; but the different appearance of the specimen calls for an examination of more material.

G. Welborni, *Elmer,* Leaflets of Philippine Botany, ii. 1908, p. 501, appears like an exaggeration of *G. luzonica.* It is described as the largest in growth of all the Gordonias (30 to 50 metres in height), with a straight trunk a metre thick. The leaves attain a length of 15 cm., which is not larger than those of *G. luzonica,* nor are they relatively wider, but the flowers have petals 3 to 4 cm. long so that their diameter must be 8 cm. The stamens however are described as relatively short. It is to be inferred from the description that the ovary contracts to the style. The flowers are creamy white.

Elmer got this species in the island of Negros in the Cuernes mountains at Dumaguete, and he records that Mrs. Clemens had found it at 4250 feet in the Lanao region of central Mindanao.

G. lanceifolia, a new species, comes near to *G. luzonica.* It has leaves of the same outline but more nearly entire, and differently veined. Its capsules terminate leafless branchlets which may be 4 cm. long. It occurs in Borneo near Kuching.

Gordonia lanceifolia. *Arbor* sempervirens. Rami ultimi pennae corvinae crassi, siccitate nigricantes, glaberrimi. Alabastra externe glaberrima. *Folia* glaberrima, anguste elliptica, vel ad apicem vel in petiolum longe admodum aequaliter angustate subacuminata, margine fere integro levissime recurvo, in siccitate rufonigrescentia, pagina inferiore pallidiore, ad 14 cm. longa ad 3.5 cm. lata: nervi secondarii visibiles, subrecte in aream intramarginalem incurrentes: petioles 3 mm. longus. *Flores* ignoti. *Capsulae* ramos ad 4 cm. longos terminantes, ad 3 cm. longae, in partes quinque loculicide dehiscentes, partibus dorso concavis, sericeis, basi 10 mm. latis deinde gradatim in apiculum angustatis. Semina 25—27 mm. longa.

Borneo, prope Kuching, collegit G. D. Haviland sub numero 1010.

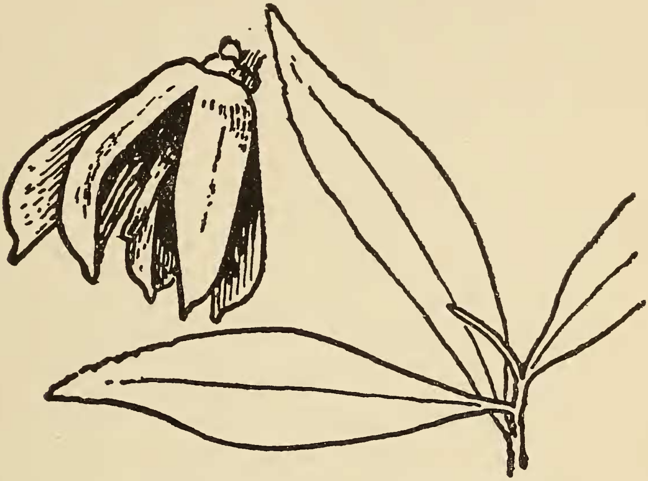

Fig. 9. Leaves of *G. lanceifolia* reduced to $\frac{1}{5}$, and capsule, natural size, from the type specimen.

Haemocharis integerrima, *Koorders and Valeton,* has leaves in shape like those of *G. lanceifolia,* but thicker, with the veins obscured. It occurs in the mountains throughout Java between 2,400 and 7,000 feet.

H. serrata, *Koorders and Valeton,* is contrasted by the authors with the above, and said to differ in its more prominent serrations near its leaf apex, its larger flowers, and hairy style (sic!). It was obtained on Gunong Pulasari in Java.

Haemocharis aromatica, though said to be near *H. vulcanica,* by Miquel, possesses a less marked montane appearance. Its leaves are very minutely subcallously serrulate and have veins which can be traced by being depressed above. No statement is made of the absence of style. If a *Gordonia* the description appears to place it here.

It was got in two varieties in Western and Southern Sumatra.

G. Balansae, *Pitard,* in Lecompte, Flore Générale de l'Indo-Chine, i. 1910, p. 348, is described as having leaves elliptic to oblanceolate, dentate, coriaceous, and so small as to be only 5 to 10 cm. long by 1.5 to 3.5 cm broad. The dentation removes the species from the neighbourhood of the small leaved Malayan species with which this enumeration will end. At the same time the petiole for the smallness of the blade is rather long (up to 8 mm.). The flowers are yellowish, and apparently about 3 cm. across. The ovary is of three loculi only, and is contracted into the style. The capsule is represented by Pitard as oblique. If this curious condition is at all constant it is very interesting, and a relationship of some closeness to *G. anomala* is suggested thereby.

G. Balansae was collected in the forests of Mount Bavi in Tonkin near to the village of Sougi by the collector Balansa.

G. axillaris, *D. Dietrich*, Syn. Plant. iv. 1850, p. 863: Szyszylowicz in Engl. Pflanzenfam. iii. No. 6, 1893, p. 185. *G. anomala,* Sprengel, Systema, iii. 1826, p. 126: Bentham, Flora Hongkong., 1861, p. 29: Forbes and Hemsley in Journ. Linn. Soc. Lond. Bot. xxxiii. 1886, p. 80. *G. Lessertii*, Szyszylowicz in Engl. Pflanzenfam. iii. No. 6, 1893, p. 185. *Camellia axillaris,* (Roxburgh very doubtfully, R. Brown more probably, through) Ker in Bot. Register, 1819, plate 349, and Sims, Bot. Mag., 1819, plate 2047. *Polyspora axillaris,* Sweet, Hort. Brit. ed. i. 1826, p. 61: Don, Dict. Gard. and Bot. i, 1831, p. 574: Hooker in Bot. Mag. 1843, plate 4019.

This species with elliptic toothed leaves, and a short but distinct petiole, has an ovary which may be made of four or of five carpels. In this perhaps is an indication of affinity to *G. Balansae.* Its flowers are white, and large (6 to 7 cm. in diameter: or according to the Gardener's Chronicle, lxi. p. 250, the flowers recently produced at Kew, 12 cm.). The ovary contracts to the style.

Bentham supposed the plant confined to the island of Hongkong, as he was unable to ascertain any record of its occurrence on the mainland of China.

Matsumura and Hayata, have recorded it from two places in the extreme north of Formosa and from one very near the middle of the island. The old errors of placing its home in Penang should have been forgotten by now, but persist; and Singapore is added equally incorrectly.

G. concentricicatrix, a new species from the lowlands between the Dindings and Malacca, is the first of two in which the broadest part of the leaf is very markedly towards the apex. It occurs as a big tree in the Selangor forests with a clean straight trunk marked by concentric rings which it is hoped to figure later.

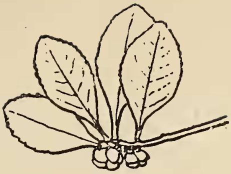

Fig. 10. A branch of *G. concentricicatrix*, reduced to $\frac{1}{5}$, from Abdul Rawi, C. F. 878.

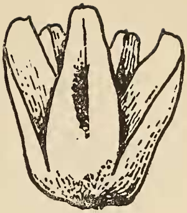

Fig. 11. A capsule of *G. concentricicatrix*, nat. size from Abdul Rawi, C. F. 898.

Gordonia concentricicatrix. *Arbor* alta 100-pedalis, cortice inaequali lineis concentricibus notata. Ramuli ultimi 2 mm. diametro, siccitate badii. *Folia* obovata, margine crenulata, apice abrupte subacuminata vel obtusissima, basi longe gradatim attenuata, glaberrima, crasse pergamentacea nervis secondariis visibilibus, ad 11 cm. longa, ad 5.5 cm. lata: petiolus ad 1 cm. longus. *Flores* lutescentes, ad 4 cm. diametro. *Sepala* dorso dense sericea, ad 1 cm. longa. *Petala* dorso dense sericea, fere ad 2 cm. longa. *Antherae* numerosissimae, versatiles, 2 mm. longae: filamenta glabra, omnia discreta ad insertionem cum petalis in tubo brevi. *Ovarium* dense sericeum, subglobosum, sub-abrupte in stylo 3 mm. longo excurrens. *Capsula* subsessilis, fere ad 4 cm. longa, in partes quinque loculicide dehiscens, partibus (inter species affines) crassis, dorso dimidio superiori impressis, vix mucronulatis. Semina 2 ad 2.5 cm. longa.

Peninsula Malayana, in silvis submontosis versus Fretum Malaccae, ex Dindings, collegit C. C. Curtis cum fructu mense Julio: ex Selangor ad Rantau Panjang collegerunt J. G. Watson, C. F. 878, etiamque Abd'ul Rawi sub numero C. F. 878 mense Aprilo et mense Maio cum floribus et cum fructibus: ex Malacca ad Brisu collegit R. Derry cum floribus sub numero 1048. Indigenae ad Rantau Panjang *Kelat merah* vocant, sed ad Brisu *Samak pulut*.

It is to be enquired if **Haemocharis marginata** (Korth.) O. Kuntze, is not of this affinity. Its leaves are described as oblong-oval or oblong-obovate and though put into *Closaschima* by the author the style is described by him as " 5-angled, 5-grooved, silky and short " which fits such an admitted *Gordonia* as *G. singaporiana* excellently. It was obtained from Mt. Tirin and from Matapura in Borneo.

Haemocharis subintegerrima, has leaves lanceolate oblong to obovate oblong. As in the case of the above the mention of obovateness suggests a place near to *Gordonia concentricicatrix* but its veins are obscured, and the marginal teeth nearly

obsolete. Kurz says that it hardly differs from *H. aromatica,* and is the same as *Gordonia Maingayi,* which appears dubious. It was obtained in Sumatra at Kobu-lahat in the Province of Palembang.

G. multinervis, *King,* in Journ. Asiatic Soc. Bengal, lix, 1890, p. 205, ends the series to which it belongs, being peculiar in the great size of its leaves. It has been collected in Perak and in Singapore. As the attached figure shows the veins in the leaf-blade are not inconspicuous, a feature shared with *G. concentricicatrix.* The flowers are only a little over 2 cm. in diameter and agree with those of *G. concentricicatrix.* Sir George King called attention to the resemblance of its leaves to those of the genus *Pyrenaria.*

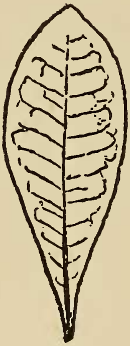

Fig. 11. A leaf of *G. multinervis*, reduced to 1/5, from Ridley 6367

G. singaporiana, *Wallich,* Cat. Lith., 1832, No. 1457, name only; Ridley in Journ. Straits Branch, Roy. Asiatic Soc., No. 73, 1916, p. 141: *G. excelsa,* var. *sincapuriana,* Dyer in Hooker fil., Flora Brit. Ind. i. 1872, p. 291: *G. grandis,* King, in Journ. Asiatic Soc. Bengal, lix, 1890, p. 203, non André. In this species the petiole is almost absent, and the leaf blade very nearly entire. In its subsessile leaves it is easily distinguished from all other Malayan species, but in Ceylon we find allied trees with such leaves. The flowers which are 3 cm. across, have been figured above (p. 133), and the ovary with its abbreviated style (p. 140) ; the leaf and a capsule are figured below. Kurz saw that it is not Blume's plant, but misidentified it with *Gordonia axillaris.*

It occurs in Singapore island, in Johore, in Malacca, and in Penang.

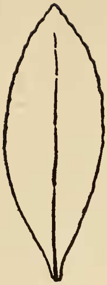

Fig. 12. A leaf of *G. singaporiana* reduced to $\frac{1}{5}$.

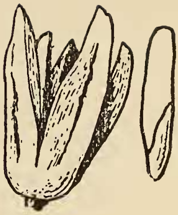

Fig. 13. A capsule of *G. singaporiana* and a seed from life, nat. size.

G. dipterosperma, *Kurz,* in Journ. Asiatic Soc. Bengal, xlv, 1876, p. 119: *G. excelsa* var. *pubescens,* Dyer in Hooker fil., Flora Brit. India, i. 1873, p. 291: *Gordonia sp.,* Griffith, Posthumous-papers, ii. p. 99 and iii, p. 200: *Dipterosperma sp.,* Griffith, Notulae, iv. 1854, p. 564.

It appears right to separate this from *G. excelsa,* as Kurz did. Kurz wrote " Blume's tree differs so much from the above in the long peduncles, large hirsute capsules, and in the texture and pubescence of the leaves, that it is difficult to understand how it could have come to be identified with the Khasi and Sikkim tree." Ridley (in this Journal No. 73, p. 142) has called attention to the large pustules from which the hairs spring on the backs of the leaves. It was collected first by Griffith at Dewangiri where he entered what is now Bhutan, and then afterwards in the Khasi hills by Kurz. Mr. C. C. Calder, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta, has been so good as to refer to all the material that he possesses and to tell me that it has been obtained in additional localities in British Sikkim.

G. excelsa, *Blume,* Bijdragen, iii. 1826, p. 130: Koorders and Valeton in Mededeelingen 'SLands Plantentuin, No. 16, 1896, p. 289: Koorders, Excursionsflora von Java, ii. 1912, p. 608: Koorders-Schumacher, Systemat. Verzeichnis, fam. 180, p. 35. *Antheeischima excelsa,* Korthals, Verh. Nat. Gesch. 1839-42, 138, t. 27.

Koorders points out that the margin of the leaves varies considerably, being toothed sometimes and sometimes not toothed. The flowers, Ridley points out, are twice as large as those of *G. singaporiana.* Koorders describes the appearance of the tree as characteristic, the young stem up to 50 cm. in diameter having a peculiar thin sloughing " brown-red-grey " bark. *G. excelsa* was obtained by Blume in the mountains of Western Java; it was obtained by Koorders on Gunong Salak in Western Java and in the Pantjur-Idjen region of East Java.

G. zeylanica, *Wight,* Illustr., i. 1840, 99: Thwaites, Enum. Florae Zeylan. 1864, p. 40: Dyer in Hooker fil., Flora Brit. India, i. 1873, p. 291: Trimen, Handbook Flora Ceylon, i. 1893, p. 110.

The almost sessile oval or oblong lanceolate leaves of this species distinctly suggest *G. singaporiana,* but they are shorter, firmer and the margins are markedly revolute often. Its white flowers are large, being 7.5 cm. in diameter. The capsules are rather over 3 cm. long. It occurs in many places about the mountains in the centre of Ceylon between 4,000 and 7,000 feet.

G. elliptica, Gardner, in Calcutta, Journ. Nat. Hist., vii. 1846, p. 448, is regarded by Trimen as a variety of *G. zeylanica* with shorter leaves and larger flowers. It occurs at one place in the same region as *G. zeylanica.*

G. speciosa, *Choisy* in Mémoires de la Société Physique de Genève, xiv. 1855, p. 52: Thwaites, Enum. Florae Zeylan., 1864, p. 40: Dyer in Hooker fil., Flora Brit. India, i. 1873, p. 292: Trimen, Handbook Flora Ceylon, i. 1895, p. 111. *Carria speciosa,* Gardner in Calcutta Journ. Nat. Hist., vii, 1846, p. 7.

By its large deep crimson flowers this is a most outstanding species. Its long ovate leaves are almost sessile or even sessile: they are entire and the margin often revolute. The flowers are nearly 10 cm. in diameter, and its capsules nearly 5 cm. long. The stamens are united into five groups.

It formerly occurred gregariously in the forest above Rambodde in Ceylon at about 4,000 feet, where clearing has been extensive and made it very rare.

G. Lobbii, *Hooker fil.,* in Trans. Linn. Soc. London, xxiii, 1860, p. 162, may be taken conveniently as the first of the last group of the genus, a group made of species with relatively small leaves whose margins are even and whose general facies suggests ability to withstand adverse conditions. It is a small or medium sized tree, with elliptic harsh entire leaves attaining 9 cm. in length, and 5 cm. in width. The expanded flower is only 2 cm. in diameter. The ovary is described as globose. It was collected by Lobb "ad Sarawak" which would mean near Kuching.

G. Havilandii, a new species, comes very near to *G. Lobbii,* and was obtained near Kuching. It differs in its petioles and its filaments, points which on further study may be found perhaps not worthy of the stress laid on them here. But until we have obtained the material needed for bridging the differences, they must be recognised.

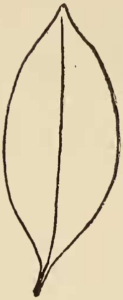

Figure 14. A leaf of *G. Havilandii* reduced to ¼ from Haviland 67.

Gordonia Havilandii. *Frutex* vel arbor, cortice ramulorum avellaneus. Ramuli ultimi 3 mm. diametro. *Folia* exacte elliptica, basi fere subacuta vel obtusa, apice aequaliter rotundata vel obtusa ad acumen breve obtusum, crasse pergamentacea, margine laevi decurvo, glaberrima, ad 12 cm. longa, ad 6 cm. lata: *Sepala* dense flavo-sericea, ad 1 cm. longa. *Petala* dorso dense flavo-sericea, 1.5 ad 1.8 cm. longa. *Antherae* numerosissimae, versatiles, 2 mm. longae: filamenta basin versus pubescentia, 1 cm. longa, discrete cum petalis inserta. *Ovarium* subglobosum, sericeum, in stylo 8 mm. longo gradatim protensum. *Capsula* immatura 1.5 cm. longa visa, matura ignota.

Borneo. In Statu Sarawak, monte Serapi, 2800 ped. alt. collegit Haviland sub numero 67, etiamque ad 3000 ped. alt. sine numero, etiamque in monte Singpi mense Decembri cum floribus sub numero 1995.

Haemocharis vulcanica, *O. Kuntze,* is described as if extremely like the last two species. It has oval or ovate-entire leaves of a similar size. But the description states that the stamens are sometimes in five groups, as in *G. speciosa* and the American *G. Lasianthus.* The ovary is described as ovoid which indicates a narrowing upwards to the five subconnate styles. Surely it is a good *Gordonia!* It was obtained on Mount Merapi in Sumatra.

G. imbricata, *King,* in Journ. Asiatic Soc. Bengal, lix, 1890, p. 204, has a distinctly zerophytic appearance. Two flushes of its foliage are figured below. The leaves are seen to be small and entire. They are harsh and thick with the margins slightly revolute. The flowers are only 2.5 cm. in diameter. The ovary narrows into the style. It occurs on the mountains of Pahang, both on Gunong Tahan and Gunong Benom at Kluang Terbang.

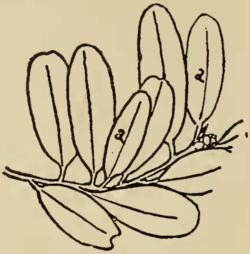

Figure 15. A branch of *G. imbricata* showing two flushes, a. a. the periodic reduced leaves, reduced to ¼ from Ridley, 16021.

G. Scortechinii, *King,* in Journ. Asiatic Soc., Bengal, lix, 1890, p. 24, might be described as *G. imbricata* with an admixture of *G. Maingayi.* Its branches however are more slender than in the first of these two and its flowers are recorded as remarkably small, the stamens being no more than 30. The locality whence it was obtained is unrecorded except as " Perak."

G. brevifolia, *Hooker fil.,* in Trans. Linn. Soc. London, xxiii, 1860, p. 162, is obviously a close ally of the last two. Its leaves are broadly ovate to obovate, with the condition of the apex varying. Its flowers are large, being nearly 4 cm. across. It was obtained on Mount Kinabalu in Borneo at about 8,000 feet.

Haemocharis buxifolia, *Szyszylowicz,* appears to be one of this set of Gordonias, and the type specimen should be re-examined with this view. It was obtained in western Sumatra at Paya Komba.

Haemocharis ovalis, (Korth.) *O. Kuntze,* is the only species of which it is clearly said that the style is indistinguishable: " Stylus haud manifestus " are Korthals words: which together with his further statement " ovarium ovoideum, apice truncatum " do indicate such a condition as is in the American *Haemocharis.*

On this account I do not attempt to find a place for it among the species of *Gordonia,* but put it at the end. Its leaves are described as much smaller than the species around *G. luzonica* (7 cm. long by 2 cm. broad) ; but they are serrulate or crenate, and therefore not as those ending the series such as *G. imbricata.*

It was obtained in the forests of Melintang in Sumatra.

No attempt is possible at placing **Haemocharis amboinensis.**

Outstanding features in the genus are:—

i. the septifragal capsule of *G. pubescens*.

ii. the wingless seeds of *G. pubescens*.

iii. the deep crimson colour of the flowers of *G. speciosa*.

iv. the union of the filaments into five groups in *G. Lasianthus* and in *G. speciosa; Haemocharis vulcanica* is said sometimes to exhibit this.

v. the reduction of the number of the carpels sometimes in *G. axillaris* and in *G. Balansae*: and also in *G. obtusa*.

vi. the distinctness of the veins in the two American species and in *G. sinensis*.

vii. the obovate shape of the leaf in *G. concentricicatrix* and *G. multinervis,* with a moderate distinctness of the veins.

viii. the slenderness of the branchlets in *G. penangensis* and *G. Maingayi*.

ix. the development of a montane small leaved type in the Malay Peninsula, Borneo, and apparently in Sumatra.